

TERMINALIA OF SOME NORTH AMERICAN SPECIES
OF *MEGASELIA* (*APHIOCHAETA*) AND DESCRIPTIONS
OF TWO NEW SPECIES (DIPTERA: PHORIDAE)

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Abstract.—Borgmeier's (1964, 1966) revision of North American *Megaselia* lacked detailed figures of the adult terminalia. In this large genus the male epandrium and hypandrium and the female tergum and sternum 6 provide excellent distinguishing characters. This work presents a brief diagnosis and figures of the male and female terminalia of the following species of the subgenus *Aphiochaeta*: *Megaselia californiensis* (Malloch), *M. capta* (Borgmeier), *M. georgiae* Borgmeier, *M. decora* new species, *M. gravis* Borgmeier, *M. laffooni* new species, *M. marginalis* (Malloch), *M. melanderi* Borgmeier, *M. nigriceps* (Loew), *M. plebia* (Malloch), *M. proclinata* Borgmeier, *M. relictata* Borgmeier, *M. robusta* Schmitz. Two species of this group, *M. decora* and *M. laffooni*, are described as new.

Borgmeier's (1964, 1966) revision of the North American *Megaselia* placed the taxonomy of this genus on a firm foundation. He studied material in several U.S. collections and was able to examine nearly all the types of North American *Megaselia*. In this work Borgmeier provided descriptions and keys for about 260 *Megaselia* species. However, Borgmeier's revision lacks detailed figures of the adult terminalia. The external terminalia of the male (epandrium and hypandrium) and of the female (tergum 6) provide excellent characters for distinguishing species. The proper use of these characters along with other structural features in species descriptions could help remove some of the difficulties in accurately determining species of this genus.

The purpose of this work is to provide a brief diagnosis and the first detailed figures of the male and female terminalia of the *Megaselia* species in Borgmeier's (1964) Group I. Two new species, *Megaselia* (*Aphiochaeta*) *decora*, and *M. (A.) laffooni* are described.

Materials and Methods

This work is based on the study of 470 Nearctic specimens of the *Megaselia* species of Borgmeier's Group I. Specimens were seen from most states and provinces of U.S. and Canada, but not from Greenland and Mexico.

I have examined, or received information on, the holotypes of all the Nearctic species of Group I. Specimens of the type-series of Holarctic species were not available for examination at this time. Information on original descriptions and synonymies can be found in Borgmeier (1964).

The methods used for removing and preparing terminalia for study were similar to those used by other workers. Terminalia were permanently

stored in 4×11 mm plastic vials, partially filled with glycerine and capped with rubber stoppers, and placed on the same pin as the insect.

External Terminalia of *Megaselia*

The external male terminalia of *Megaselia* species are platyperzid-like in appearance. A brief explanation will help to understand the simple structure of the preabdomen and postabdomen.

The preabdomen (segments 1-6) is moderately elongate and more or less cylindrical. The terga are generally unequal in size, and the sterna are absent.

The postabdomen of the male (Fig. 1) lies in a straight, longitudinal relationship with the preabdomen. Terga and sterna 7 and 8 are absent. The epandrium (EP, Fig. 1) is generally symmetrical and often has scattered setae laterally. The hypandrium (Fig. 2) is generally asymmetrical; the right side, and occasionally the left side, bears a setulose lobe that extends posteriorly. The proctiger (PR, Fig. 1) is well developed; the cerci are distinct (Fig. 1) and fused along the mid-line.

The postabdomen of the female consists of an elongate ovipositor that telescopes within segment 6. The ovipositor is entirely membranous—never forming a horny, nonretractile stylet. Terga and sterna 7 and 8 are reduced and are sometimes absent. The cerci are distinct and bear numerous setae.

Group I *Megaselia* (*Aphiochaeta*)

The practice of partitioning the hundreds of *Megaselia* species into eight "artificial" groups as frequently done by other authors (Lundbeck, 1922; Schmitz, 1956; Borgmeier, 1964) has been followed here. These groups provide an excellent, albeit arbitrary, means of reducing the large numbers of species into small, workable taxonomic groups. The structural characters upon which these groups are based (see Borgmeier, 1964) are relatively constant and discernible on all but the poorest specimens.

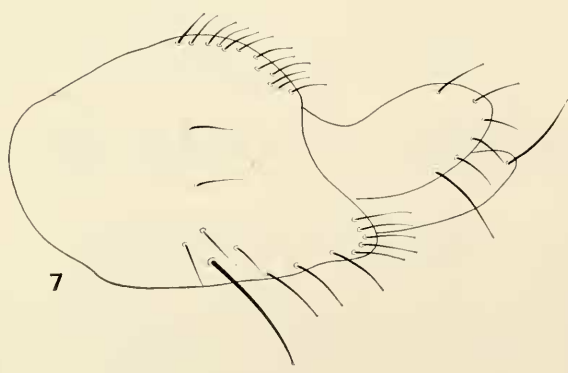
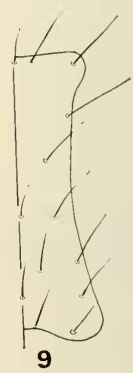
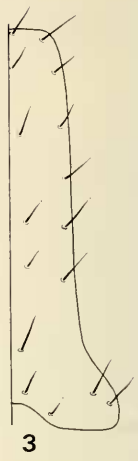
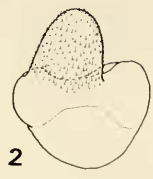
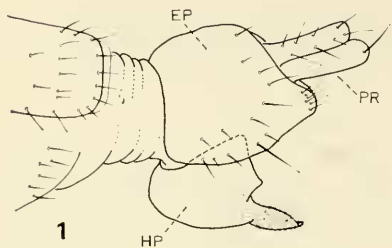
Species of Group I can be distinguished by the setose mesanepisternum and the 4-6 scutellar bristles. This group is known from males of 13 Nearctic species, including the two new species described below; females are known for only 4 species of the Group.

Megaselia (*A.*) *nigriceps* (Loew) and *M.* (*A.*) *robusta* Schmitz are the only known Holarctic species of this group.

Megaselia (*Aphiochaeta*) *californiensis* (Malloch)

Figs. 11, 20

Diagnosis.—This species can be distinguished from other Nearctic *Aphiochaeta* species with 4-6 scutellars by the following combination of characters: Mesanepisternum without bristles; halter brown; fore basitarsus



enlarged apically; costa 48-52% of wing length. Terminalia: Epandrium (Fig. 11) short, with numerous bristles ventro- and posterolaterally; hypandrium (Fig. 20) bare, except for setulae on lobe. Female unknown.

Known distribution.—California, Washington.

Material examined.—Two ♂, 1 ♀.

Megaselia (Aphiochaeta) capta Borgmeier

Figs. 18, 19

Diagnosis.—The male differs from other Nearctic *Aphiochaeta* species with 4-6 scutellars by the character combination: Mesanepisternum with bristles; costa 41% of wing length. Terminalia: Epandrium (Fig. 18) curved under proctiger, with 1 strong bristle posterolaterally; hypandrium (Fig. 19) setulose laterally, setulae longer on lobe. Female unknown.

Known distribution.—Virginia.

Material examined.—Holotype.

Megaselia (Aphiochaeta) georgiae Borgmeier

Figs. 14, 21

Diagnosis.—The male differs from other Nearctic *Aphiochaeta* species with 4-6 scutellars by the character combination: Scutellum with 6 bristles; mesanepisternal bristle absent. Terminalia: Epandrium (Fig. 14) higher than wide, with numerous bristles, left side with long, unarticulated process directed posteroventrally; hypandrium (Fig. 21) setulose, with 1 long, slender, setulose lobe. Female unknown.

Known distribution.—Georgia.

Material examined.—Holotype.

Megaselia (Aphiochaeta) decora Robinson, new species

Figs. 5, 22

Diagnosis.—The male differs from other Nearctic *Aphiochaeta* species with 4-6 scutellars by the character combination: Mesanepisternum without bristles; propleuron with numerous scattered fine setae and bristles, and the presence of 2 supra-antennal bristles. Female unknown.

Description of male.—Body yellowish brown. Frons brown, dull, as wide as high; 1 pair of supra-antennals, more approximate than preocellars; inner frontal bristle midway between supra-antennal and outer frontal bristle;

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Figs. 1-9. *Megaselia* spp. terminalia. 1. *M. nigriceps*, male terminalia; 2. *M. nigriceps*, male hypandrium; 3. *M. nigriceps*, female tergum 7; 4. *M. marginalis*, male epandrium; 5. *M. decora*, male epandrium; 6. *M. marginalis*, female tergum 7; 7. *M. gravis*, male epandrium; 8. *M. relictata*, female tergum 7; 9. *M. robusta*, female tergum 7.

posterior frontal bristle on slightly higher level than preocellar bristle. Parafacia with 3 bristles. Third antennal segment brown. Palpus brown.

Thorax brown; propleuron with numerous scattered setae, 1 strong ventral and 3 dorsal propleural bristles; mesanepisternum with about 22 fine setae, bristles absent. Scutellum with 4 bristles.

Abdominal terga brown; sterna yellowish brown. Terminalia long, brown; proctiger yellow; epandrium (Fig. 5) slightly longer than tergum 6, with scattered setae; hypandrium (Fig. 22) bilobed, lobes unequal, with setae.

Legs brownish yellow; fore tibia with small anterodorsal bristles, and 18 short, weak posterodorsal bristles; hair-seam extending 0.8 length of tibia; middle basitarsus with 2 weak bristles on basal $\frac{1}{2}$. Hind femur with 9 decumbent bristles on basal $\frac{1}{2}$; hind tibia with indistinct anterodorsals, 5 strong, widely spaced posterodorsals on apical $\frac{1}{2}$, and 3-4 short posterodorsals on apical $\frac{1}{2}$; hind basitarsus with 2 bristles near distal $\frac{1}{2}$.

Wing 2.54 mm long; membrane hyaline, veins pale brown; costa 47% of wing length, ratio of first 2 costal divisions 2:3; costal bristles long; 6 axillary bristles. Halter entirely brownish yellow.

Material examined.—Holotype.

Holotype.—Male, Cowichan Lake, British Columbia, II-20-1964, J. A. Chapman. Type No. 15131, in the Canadian National Collection.

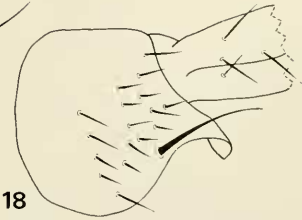
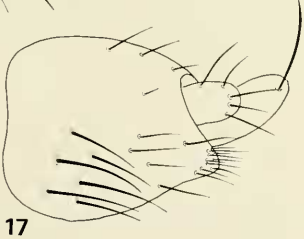
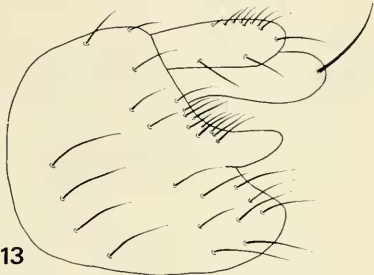
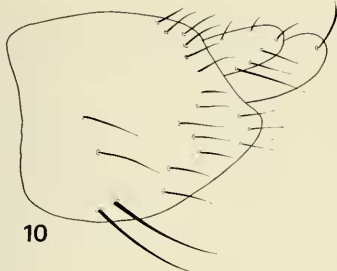
Remarks.—The type-specimen was apparently mounted from alcohol.

Megaselia (Aphiochaeta) laffooni Robinson, new species
Figs. 17, 23

Diagnosis.—The male differs from other Nearctic *Aphiochaeta* species with 4 scutellars by the character combination: Mesanepisternum without bristles; costa 47% of wing length; knob of halter and palpus blackish brown. Female unknown.

Description of male.—Body blackish brown. Frons blackish brown, dull, as wide as high; supra-antennals subequal, lower pair closer than upper pair to median furrow, upper pair about as far as preocellar from median furrow; inner frontal bristle close to outer frontal bristle; posterior frontal bristle higher than preocellar. Parafacia with 5 bristles. Third antennal segment dark brown. Palpus blackish brown, narrow and pointed apically.

Thorax blackish brown; propleuron without scattered hairs, 3 ventral and 3 dorsal propleural bristles in a row adjacent to anterior spiracle; mesanepisternum with 8-10 fine setae, bristles absent. Scutellum with 4 bristles.



Abdominal terga blackish brown; sterna brown. Terminalia small, blackish brown; proctiger small, pale brown; epandrium (Fig. 17) with strong bristles ventrally near base, and weak bristles posterolaterally; hypandrium (Fig. 23) with 1 lobe bearing fine setae.

Legs dark brown; fore tibia with indistinct antero- and posterodorsal bristles; fore basitarsus enlarged, broader than apex of fore tibia. Middle tibia with 8 anterodorsals and 4 weak, decumbent posterodorsal bristles; hairseam extending $\frac{1}{2}$ length of tibia; middle basitarsus with 2 weak bristles on basal $\frac{1}{3}$. Hind femur with 7 short, widely spaced fine setae on slightly more than $\frac{1}{2}$; basal hind tibia with indistinct anterodorsal bristles, 14 posterodorsal bristles that are weak on basal $\frac{1}{2}$ of row; hair seam; strongly arched. Hind basitarsus with 1 bristle on basal $\frac{1}{3}$.

Wing 1.62 mm long; membrane pale brown, veins dark brown; costa 47% of wing length, ratio of first 2 costal divisions 2:0; costal bristles long; 4 axillary bristles. Halter entirely blackish brown.

Material examined.—Holotype.

Holotype.—Male, Isabel Pass, 2,900', mile 206, Richardson Highway, III-13-1962, P. J. Skitsko. Type No. 15132, in the Canadian National Collection.

Remarks.—I take pleasure in naming this phorid for the late Dr. Jean L. Laffoon of Iowa State University. As a scholar, teacher, dipterist and friend he was as unique as this species.

Megaselia (Aphiochaeta) gravis Borgmeier

Figs. 7, 24

Diagnosis.—The male differs from other Nearctic *Aphiochaeta* species with 4–6 scutellars by the following combination of characters: Mesanepisternum without bristles; costa 55% of wing length; and hind femur with 8 long bristles on basal $\frac{1}{2}$. Terminalia: Epandrium (Fig. 7) setulose dorsally; hypandrium (Fig. 24) setulose laterally, lobe setulose and with long, fine setae apically. Female unknown.

Known distribution.—Alaska.

Material examined.—Holotype.

Megaselia (Aphiochaeta) marginalis (Malloch)

Figs. 4, 6, 25

Diagnosis.—This species differs from other Nearctic *Aphiochaeta* species by the combination of 6 scutellar and 1 mesanepisternal bristle. Terminalia: Epandrium (Fig. 4) subshining dorsally, setose laterally, with 4–6 bristles ventrally near base; hypandrium (Fig. 25) symmetrical, bilobed. Oviscapt: Tergum 7 (Fig. 6) broad, with 4 fine apical setae; sternum 7 narrow, Y-shaped and with 2 apical setae on each fork of Y.

Known distribution.—Florida, Georgia, Iowa, Kansas, Maryland, Michigan, Missouri, New York, Tennessee, Virginia, Wisconsin.

Material examined.—Sixteen ♂, 7 ♀.

Remarks.—This species is structurally similar to *M. georgiae* (Nearctic), and *M. flavicoxa* (Palearctic).

Biology.—Two females were collected from the cell of the scarab beetle *Peltotrupes youngi* Howden, in Florida.

Megaselia (Aphiochaeta) melanderi Borgmeier

Figs. 15, 26

Diagnosis.—The male differs from other Nearctic *Aphiochaeta* species with 4 scutellars by the character combination: Costa 53% of wing length; costal bristles long; halter and palpus brown. Terminalia: Epandrium (Fig. 15) with scattered setulae and 6–8 bristles; hypandrium (Fig. 26) setulose, bilobed, right lobe longer than left. Female unknown.

Known distribution.—Florida (Royal Palm Park).

Material examined.—Holotype.

Remarks.—The type-locality for this species is about 35 miles southwest of Miami, Florida. This region might be considered transitional between the Nearctic and Neotropical regions.

Megaselia (Aphiochaeta) nigriceps (Loew)

Figs. 1, 2, 3

Diagnosis.—This species differs from other Nearctic *Aphiochaeta* species with 4 scutellars by the character combination: Mesanepisternum without bristles; scutellars long, subequal; costa 50–53% of wing length. Terminalia: Epandrium (Fig. 1) setulose posterolaterally and with 1–2 long bristles ventrally; hypandrium (Fig. 2) bare except for setulose lobe. Oviscapt: Tergum 7 (Fig. 3) long, arched basally.

Known distribution.—Widespread in U.S. and western Canada.

Material examined.—Two hundred twelve ♂, 155 ♀.

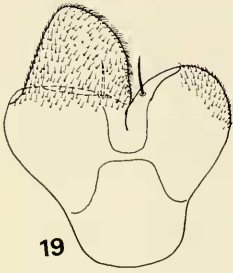
Remarks.—The coloration of this species ranges from yellowish brown to blackish brown. The darker individuals seem to have a predominantly northern distribution and the paler individuals have a more southern distribution. The male palpus and fore basitarsus are generally large, but in some specimens they are slender. The record of this species feeding on garbage (Aldrich, 1897) was an error; Aldrich actually had specimens of *M. cavernicola* (Brues).

Megaselia (Aphiochaeta) plebia (Malloch)

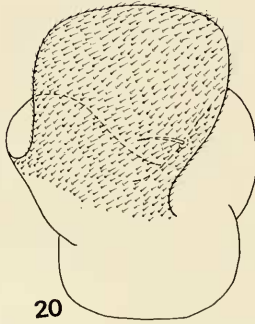
Figs. 10, 27

Aphiochaeta pallidiventris Malloch, 1919:47. NEW SYNONYMY.

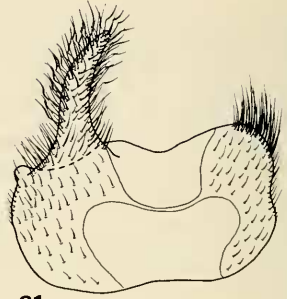
Megaselia (Aphiochaeta) wirthi Borgmeier, 1964:277. NEW SYNONYMY.



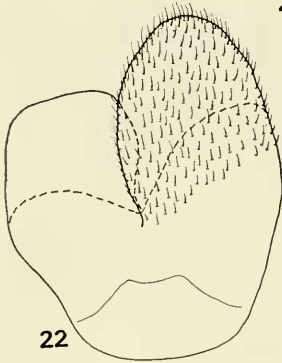
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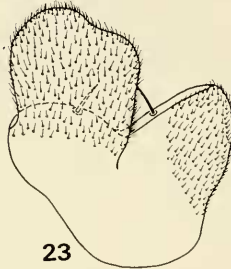
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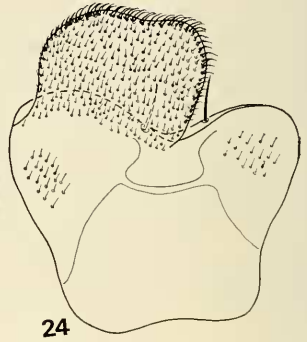
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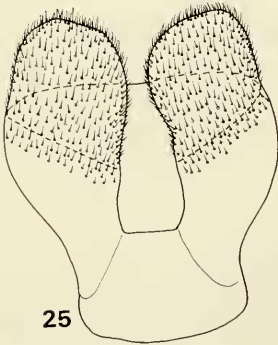
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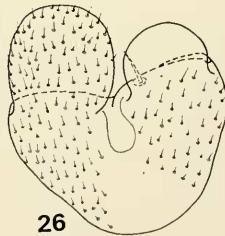
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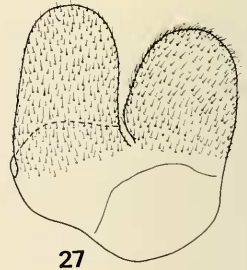
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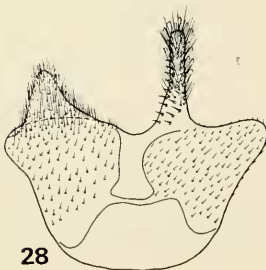
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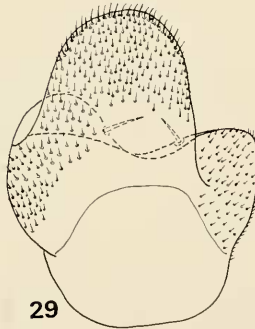
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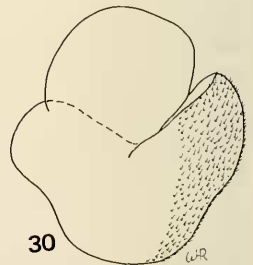
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Diagnosis.—This species differs from other Nearctic *Aphiochaeta* species by the character combination: Mesanepisternum with 1–2 bristles; fore tibia with 12–14 strong anterodorsal bristles; halter yellow; costa 45–50% of wing length. Terminalia: Epandrium (Fig. 10) with 2 strong bristles ventrally near base; hypandrium (Fig. 27) setulose. Oviscapt; Terga and sterna 6 and 7 absent.

Known distribution.—Arkansas, Kansas, South Carolina, Virginia.

Material examined.—Fifteen ♂, 12 ♀.

Remarks.—The female of this species is very striking in having tergum 1 dark brown, terga 2–3 entirely or in part pale brown to brownish orange, and terga 4–6 yellowish orange. *Megaselia plebeia* was apparently described from pharate adult males (not 1 male and 2 females as stated by Malloch, 1914). The female of this species (*M. pallidiventris*) may have been described as new because of the striking coloration of the abdomen and inadequate description of *M. plebeia*. Borgmeier (1964) described *M. wirthi* before seeing the types of *M. plebeia* and *M. pallidiventris*.

Megaselia (Aphiochaeta) proclinata Borgmeier

Figs. 12, 28

Diagnosis.—The male can be distinguished from other Nearctic *Aphiochaeta* species by the presence of 6 supra-antennal bristles. Terminalia: Epandrium (Fig. 12) small, higher than wide, with numerous bristles posterolaterally, left side with long, unarticulated process directed posteriorly; hypandrium (Fig. 28) setulose laterally, bilobed. Female unknown.

Known distribution.—Virginia.

Material examined.—Holotype.

Remarks.—The presence of 6 supra-antennal bristles is unique for this group of species. It is possible that one pair are supernumerary. However, the male of *M. proclinata* is easily recognized, also, by the unusual shape of the epandrium.

Megaselia (Aphiochaeta) relicta Borgmeier

Figs. 8, 13, 30

Diagnosis.—This species differs from other Nearctic *Aphiochaeta* species with 4 scutellars by the character combination: Mesanepisternum with 1 bristle; halter brown; costa 46–47% of wing length. Terminalia: Epandrium (Fig. 13) shining, right side with short, unarticulated process posterolat-

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Figs. 19–30. *Megaselia* spp. male hypandria. 19. *M. capta*; 20. *M. californiensis*; 21. *M. georgiae*; 22. *M. decora*; 23. *M. laffooni*; 24. *M. gravis*; 25. *M. marginalis*; 26. *M. melanderi*; 27. *M. plebeia*; 28. *M. proclinata*; 29. *M. robusta*; 30. *M. relicta*.

erally; hypandrium (Fig. 30) setulose laterally on right side, lobe without setulae. Oviscapt: Tergum 7 (Fig. 8) short, an inverted-Y-shape.

Known distribution.—Illinois, Iowa, Kansas, Washington.

Material examined.—Two ♂, 3 ♀.

Megaselia (Aphiochaeta) robusta Schmitz

Figs. 9, 16, 29

Diagnosis.—The male differs from other Nearctic *Aphiochaeta* species with 4 scutellars by the presence of a row of 10–12 short ventral bristles on the basal $\frac{1}{3}$ of the hind femur. Terminalia: Epandrium (Fig. 16) with 4–6 scattered bristles and 1 long bristle; hypandrium (Fig. 29) setulose laterally on right. The female differs by the character combination: Mesanepisternum without bristles; palpus narrow and with 1 row of ventral bristles; halter yellowish brown; costa 50–55% of wing length. Oviscapt: Tergum 7 (Fig. 9) broad, slightly arched basally.

Known distribution.—Alaska, western Canada, New Hampshire, northern Europe.

Material examined.—Nineteen ♂, 21 ♀.

Biology.—The holotype was reared from larvae in decaying vegetation.

Discussion

The Groups in the genus *Megaselia* are practical entities and are not necessarily monophyletic. A review of the figures presented in this paper indicates considerable variation in the male terminalia of Group I *Megaselia*. There are some species with primitive, platypezid-like terminalia, and some with more derived terminalia features.

The Group I *Megaselia* species (North America) with the most primitive terminalia features include *M. decora*, *M. marginalis*, *M. melanderi*, *M. plebeia*, *M. proclinata* and *M. relictata*. The male terminalia of these species is characterized by one or more unsegmented processes on the epandrium and/or a bilobed hypandrium.

There are two species in which these conditions can be seen best. In *M. proclinata* (Fig. 12) the epandrium has an elongate, unsegmented process similar to the surstyles of platypezids. The hypandrium of *M. marginalis* (Fig. 25) represents the most primitive, unspecialized condition. It is symmetrical and bilobed, and the lobes are of equal size.

The Group I *Megaselia* species with the most derived terminalia features include *M. californiensis*, *M. capta*, *M. georgiae*, *M. gravis*, *M. laffooni*, *M. nigriceps* and *M. robusta*. The terminalia of these species is characterized by a simple epandrium, without lateral processes (except in *M. georgiae*), and/or a single-lobed hypandrium.

As knowledge of the male and female terminalia of *Megaselia* increases, so will our ability to construct a phylogenetic classification of this genus.

Acknowledgments

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